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Children's Early Acquisition of the Passive: Evidence from Syntactic Priming

Katherine Thatcher, Holly Branigan, Janet McLean and
Antonella Sorace

University of Edinburgh

Abstract

We report an experiment that examined 3- and 4-year-old children's representation of the passive structure. Early studies of typically-developing children's acquisition of the passive suggest that this construction is acquired late and – or that its acquisition is semantically constrained: children comprehend actives much earlier than passives and comprehend actional verb passives earlier than non-actional verb passives (Maratsos, Fox, Becker & Chalkley, 1985). Conversely, some production studies have shown the passive is acquired earlier than thought: 3-4 year old children produce passives following training (Brooks & Tomasello, 1999) and priming (Huttenlocher, Vasilyeva & Shimpi, 2004), however, such studies have not examined whether the passive is constrained to actional verbs early on. We report a syntactic priming study that manipulated Prime Structure (active vs. passive) and Verb Type (actional vs. non-actional). We found a strong and reliable effect of Prime Structure for children (27%) and adult controls (19%). There was, however, no effect of Verb Type ($F_s < 2$). Participants were more likely to produce passive targets following passive primes than active primes, irrespective of the verb. We conclude that children do acquire an abstract syntactic representation for the passive early on (by 3-4 years) that is not constrained by verb type.

1 Introduction

1.2 Studies of Children's Acquisition of the Passive

Previous research into children's comprehension of the passive has repeatedly found that they comprehend actional verb passives (1a) better than non-actional verb passives (1b), the latter not being reliably understood until beyond the age of five years (Maratsos et al., 1985; Sudhalter & Braine, 1985; Borer & Wexler, 1987; Gordon & Chafetz, 1990; Marchman, Bates, Burkardt, & Good, 1991; Fox & Grodzinsky, 1998; Hirsch & Wexler, 2004).

- 1) a. The boy was *hit* by the girl
- b. The boy was *loved* by the girl

One explanation to account for this oft-replicated result is that the acquisition of the passive is semantically constrained such that children generalize the passive structure to highly transitive verbs first, such as physical action verbs or verbs of

result, before generalizing it to less transitive, non-actional verbs such as psychological or experiential verbs at a later age (Maratsos et al. 1985).

An alternative argument is that aspects of the passive construction are acquired late and that children use some other strategy at a younger age which results in them comprehending or appearing to comprehend actional but not non-actional verb passives. For example, Borer & Wexler (1987) argue that the ability to form argument chains, required to move a verb's object into subject position in constructions such as the passive, is not acquired before 5 years of age and that before then the strategy children use is to analyse verbal passive sentences as adjectival passives. Their explanation for the discrepancy in results of comprehension tests is that such an analysis may be felicitous with actional verb past participles but not with non-actional verb past participles, hence children's inability to comprehend these passives.

Alternatively, Fox & Grodzinsky (1998) propose that the ability to transmit the passive verb's external thematic role to the oblique noun phrase is acquired late and that the strategy young children use to interpret full passives is to assign an agentive thematic role from the preposition *by*, a strategy that works for actional passives (hence children's comprehension of these) which tend to have an agent subject role but not for non-actional verb passives (hence children's poor performance with these) whose external argument tends to be a theme or experiencer and therefore is not compatible with the role assigned by the preposition *by*.

A wider review of the literature however reveals a great deal of evidence suggesting the passive is not acquired late. For example, the passive appears in children's spontaneous speech from around the age of three (Budwig, 1990) and elicited production studies have also shown that children can produce full passive sentences by four years. Huttenlocher et al. (2004) used passive primes to elicit passive sentence descriptions of pictures from four year olds and Tomasello, Brooks & Stern (1998) found that three and a half year olds who heard the structure modelled in sentences with novel verbs produced more passives with different novel verbs than a control group. Furthermore, such studies using novel verb experiments also show early productive use of the passive structure suggesting that children of this age can generalize the syntactic construction to new items (see also Pinker, Lebeaux & Frost, 1987; Brooks & Tomasello, 1999). Finally, it has also been shown that when placed in a discourse context in which a full passive utterance was appropriate, that is, one where the discourse focus was on the patient but where there was also more than one possible agent present, children as young as three were able to produce full passive utterances (Crain, Thornton & Murasugi, 1987). This language production research suggests that the passive is neither acquired as late as previously suggested nor that children use alternative strategies for producing passive-like utterances before being able to produce full passive sentences.

Though this research shows that alternative experimental methods may show earlier competence with the passive than has been demonstrated in comprehension tests, these studies have, however, only tested children's production of *actional* verb passives and as such the question of whether children's early knowledge of the passive is restricted to highly transitive verbs before non-actional, psychological verbs remains unaddressed by language production research. The present study addresses the question of whether there is a semantic constraint on English-speaking children's early passives using a method, syntactic priming, that has successfully shown that children have a syntactic representation for the passive at a young age.

1.2 Syntactic Priming

The term 'syntactic priming' refers to the tendency amongst speakers to repeat the syntactic structure of an utterance used in previous discourse and has been both

observed in conversational contexts (Weiner & Labov, 1983) and used as an experimental method for manipulating participants' speech (Bock, 1986). Through prior processing of a syntactic structure a speaker becomes more likely to repeat that structure in a subsequent utterance, thus a speaker is more likely to produce a passive sentence after hearing a passive sentence prime, such as (2a), than after hearing an active sentence prime such as (2b). This effect of structural repetition has been variously attributed to repetition of the processing mechanisms of language production (Bock, 1986); residual activation of linguistic representations (Branigan, Pickering, Liversedge, Stewart & Urbach, 1995); and implicit learning (Bock, Dell, Chang & Onishi, 2007).

- 2) a. The pig is being washed by the farmer
- b. The farmer is washing the pig

How can this be related to children's acquisition of the passive? It follows that participants may be primed to reproduce a syntactic structure only if that structure has been acquired already. To date, there have been a few priming experiments that have tested children's acquisition of the passive. These studies have generally shown that young children were more likely to produce passive descriptions following passive primes than following active primes – this structural repetition in the absence of repeated lexical items between prime and target suggests that children have indeed acquired an abstract representation for the passive by four (Huttenlocher et al., 2004; Whitehurst et al., 1974) or even three (Bencini & Valian, 2006), though see also Savage, Lieven, Theakston & Tomasello (2003) for different results and interpretation. However, these studies used actional verbs for both the prime and target items, none of these studies have employed this method to investigate the issue of semantic constraints to children's early passives. The present study therefore investigated priming of passive sentences with children aged three and four years old and specifically looked at whether any priming effect varied according to the verb type of the prime.

We hypothesized that if children's early development of the passive construction was based on a core class of verbs, actional verbs, the children would have an early syntactic representation for the passive that was only linked to verbs from that verb class and would therefore only be primed by same-class verbs also linked to the passive representation (see Figure 1: *hit* and *push* are both action verbs and so are linked to the passive structure node, either should prime the other, however *scare* and *love* are not action verbs and so the passive construction is not yet generalized (linked) to them – they should not therefore prime or be primed by passives). The alternative, null, hypothesis is that children acquire the passive with non-actional verbs as early as action verbs (see Figure 2). In this case we would expect the same priming effect from both actional and non-actional primes.

Figure 1. Schema if the passive is only generalized to actional verbs early on

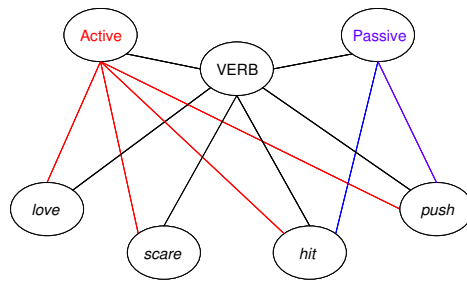
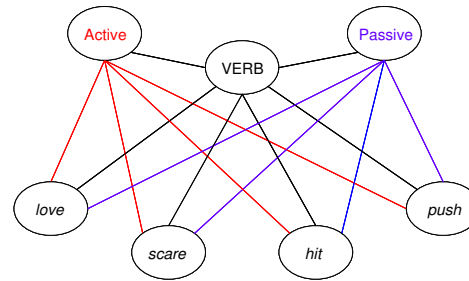


Figure 2. Schema if the passive is not semantically constrained early on



1.3 Questions and Predictions

This study addressed the following questions therefore: do children acquire an abstract syntactic representation for the passive before 5 years old? It was predicted that if they do not, then no priming effect would be observed. It was furthermore predicted that if children's early knowledge of the passive construction is restricted to item-based (verb-based) representations (Tomasello, 2000) then no priming would occur since there was no overlap between the lexical items in the primes and targets. The second question addressed in this study was: is children's early acquisition of the passive constrained to actional verbs and only generalized to non-actional verbs at a later age? It was predicted that if children do have a semantically constrained representation for the passive early on (Figure 1) then priming would only be observed in the actional prime condition but if not (Figure 2) then priming would occur in both verb type conditions.

2 Method

2.1 Priming Task

The priming task was a picture description task embedded in a children's card game, 'Snap' (Branigan, McLean & Jones, 2005). In Snap, two players each have a set of picture cards placed face-down in front of them. They take it in turns to turn over their top card and reveal its picture, when both players reveal the same picture on their cards it is the first player to shout 'snap' who wins the cards in play. The game continues until one player has won all the cards.

In the experiment the only variations to the game were that the players described their picture as they turned it over and the game ended when all cards had been turned over once. A game was used to mask the priming and to make the task easy and more appealing to children; they were not under pressure to provide 'correct' answers.

2.2 Participants

The participants were 20 pre-school children (10 girls), ranging in age from 3;1 to 4;11 (mean age 4;2). All children were acquiring English as their first and only language and none were reported to have any language or developmental difficulties. A control group of 20 adult, native speakers of English (15 female), were recruited from the University of Edinburgh student population and paid for their participation.

2.3 Design

There were two priming conditions: Prime Structure (Active vs. Passive) and Verb Type (Actional vs. Non-Actional) which combined created the four priming conditions. The experiment was based on a repeated measures design: all participants experienced all levels of all priming conditions and so the experiment measured whether the children alternated their response structure after hearing alternative prime structures with alternative verb types.

2.4 Materials

The materials consisted of a set of Snap picture cards depicting transitive events with human patients and animal agents. Where possible, nouns and verbs were chosen that had been used in previous experiments of children's acquisition of the passive and – or that had a suitable age of acquisition rating for the children participating in the study (Morrison, Chappell & Ellis, 1997). Those required to describe a target item were different to those used in its primes (see Figure 3); the repetition of lexical items between the prime and target was avoided to ensure any priming effect observed was related to abstract structural representations and not attributable to item-based representations (Tomasello, 2000).

Figure 3. Actional verb and non-actional verb primes with actional verb target



Twelve actional verbs (shake, wash, tickle, push, kiss, punch, lick, hug, chase, kick, scratch, pinch) were used twice each to create 24 target items. Each target item had an actional verb and non-actional verb prime, both depicted with the same agent and patient, though a participant only saw either the actional or non-actional prime for a given target picture. There were 24 actional primes made up of six different actional verbs (hit, pat, bite, pull, squash, carry) used four times each and 24 non-actional primes created from six non-actional verbs (frighten, shock, annoy, upset, surprise, scare) used four times each.

Further to the prime and target items, a set of eight filler items formed the Snap items of the game; these items had the same picture so here the same verb was used for the prime and target: four new actional verbs were used once in the passive and once in the active each. Finally a set of four practice items was also created using different verbs and nouns to the experiment and filler items.

2.5 Procedure

The experiment began with a practice session: first the participants were shown individual pictures of each of the characters and were asked to name them. Then a very short game of Snap was played with the practice items. Participants who

completed both parts of the practice session then played the full game using the experiment materials.

Pre-arranged playing cards were placed face-down in front of the players (the experimenter and the participating child). The experimenter began each game by turning over her top card and describing it (covertly, according to a priming script). The participant then took their top card and described it. The game continued until all the cards had been turned over and described. The experimenter's descriptions of her cards were, unknown to the participant, primes for the participants' subsequent description of their own card. Each prime and response constituted an individual experiment trial. These were interspersed with the filler items that were the matching 'Snap' items. Priming was therefore measured on a trial by trial basis depending on whether or not the participant repeated the syntactic structure he heard in the prime in his immediately following description. The experiment game was audio-recorded on a Mini-Disc player; the participants' responses were transcribed after the experiment and were scored according to the criteria outlined below.

3 Results

3.1 Scoring criteria

The participant's first complete target utterance for a given item was scored as either Active, if the utterance contained an agent in subject position, an appropriate verb and a patient in direct object position, or Passive, if the utterance contained a patient in sentence-subject position, a passive auxiliary (either *get* or *be*), an appropriate verb and an agent expressed in a *by*-phrase; minor errors, such as the participant making a morphological error in the verb phrase, were allowed since it was considered that these did not reflect the selection of a different underlying structure. Incomplete utterances, reversed passives (where the participant produced a passive sentence but with the argument roles reversed), truncated passives, (where the participant omitted to produce a *by*-phrase) and any utterances that were syntactically correct but not a transitive sentence were scored as Other and excluded from the analyses.

3.2 Results

Out of the 480 target items, the children produced 312 (65%) responses that could be scored as either Active (236, 49%) or Passive (76, 16%) and 156 (32%) responses that were scored as Other, (12 (3%) trials were eliminated when the child failed to respond or the response was lost due to recording problems or misplaced cards).

The 312 transitive targets (active and passive responses) were evenly distributed across the priming conditions: 25% occurred in the active actional prime condition, 28% occurred in the active non-actional condition, 23% in the passive actional condition and 24% in the passive non-actional condition. Table 1 shows how many actives and passives the children (and adults) produced in each priming condition. It is clear that, numerically, both groups produced more passives following passive primes compared to following active primes (and more actives were produced following active primes compared to following passive primes), although roughly even numbers of passives were produced following actional primes as following non-actional primes.

Table 1. Number of passives produced in each priming condition response

Priming Condition		Children		Adults	
		Active	Passive	Active	Passive
Active	Actional	73	6	102	9
	Non-Actional	77	10	97	11
Passive	Actional	40	31	78	35
	Non-Actional	46	29	78	27

3.3 Analysis

For the statistical analyses of the priming data, the participants' active and passive scores were converted into proportions of active and passive responses for each priming condition in order to allow for the uneven numbers of transitive responses across conditions. For a given priming condition the number of passive responses for each case was divided by the sum of the passive and active responses for that case (see Table 2 for the mean proportions by condition). The proportions of active responses were also calculated in this manner though the statistical analyses were only performed with the passive scores since these are of primary interest and, due to the way the proportions are calculated, the active and passive scores are in complementary distribution.

Table 2. Mean proportion of passive responses produced in each priming condition

Priming Condition		Children	Adults
Active	Actional	0.10	0.08
	Non-Actional	0.17	0.10
Passive	Actional	0.44	0.31
	Non-Actional	0.38	0.26

The proportions of passive responses were compared in a repeated measures, 2 (Prime Structure) x 2 (Verb Type) x 2 (Group) ANOVA, treating participants (F1) and items (F2) as random effects. This showed a significant main effect of Prime Structure ($F(1,38) = 30.27$, $p < .001$, partial $\eta^2 = .443$, $F(1,46) = 72.99$, $p < .001$, partial $\eta^2 = .613$); more passives were produced following passive primes than active primes, in fact overall there was a 23% priming effect of passive primes. However, the effect of Verb Type was not significant ($F_s < 2$); passive responses were just as likely following actional primes as following non-actional primes. No other interactions were significant (all $F_s < 3$) except for the prime by group interaction which was significant by items only, though the effect size was not large ($F(1,38) = .99$, $p = .33$, partial $\eta^2 = .025$, $F(1,46) = 5.05$, $p < .05$, partial $\eta^2 = .099$). The effect of Group approached significance by items ($F(1,38) = 2.38$, $p = .13$, partial $\eta^2 = .059$, $F(1,46) = 3.62$, $p = .06$, partial $\eta^2 = .073$) suggesting that neither group produced significantly more passives than the other.

Planned comparisons showed that there was a simple main effect of prime for both children ($F(1,19) = 21.11$, $p < .001$, partial $\eta^2 = .357$, $F(1,23) = 548.23$, $p < .001$, partial $\eta^2 = .559$), and adults ($F(1,19) = 10.15$, $p = .003$, partial $\eta^2 = .211$, $F(1,23) = 19.82$, $p < .001$, partial $\eta^2 = .301$); and for both verb types, actional ($F(1,19) = 29.95$, $p < .001$, partial $\eta^2 = .441$, $F(1,23) = 50.66$, $p < .001$, partial $\eta^2 = .524$), and non-actional ($F(1,39) = 9.62$, $p = .004$, partial $\eta^2 = .202$, $F(1,23) = 23.67$, $p < .001$, partial $\eta^2 = .340$) showing that both participant groups were more likely to

produce passive targets following passive primes than active primes and that passive responses were more likely following non-actional verb passive primes than non-actional active primes and likewise for actional verb passive primes compared to active primes.

Table 3. Percentage priming effects

	children	adults
Actional	34%	23%
non-actional	21%	16%
Overall	27%	19%

The percentage priming effects for each verb type and overall are presented in Table 3: they show the percentage increase in the mean proportion of passives produced after passive primes compared to after active primes, that is, the increase in passives produced when primed compared to when not primed. As can be seen in Table 3, there was a strong priming effect in both verb type conditions and for both groups. The results from the statistical analyses suggest the participants were influenced by the structure of the prime but not by the verb type of the prime.

4 Discussion

The present study investigated priming of passive sentences with children aged three and four years old and adult controls and specifically compared actional verb primes with non-actional verb primes. Overall we found that the nursery children behaved like the adult control group: they were more likely to produce a passive description after hearing a passive prime than an active prime, irrespective of whether the prime verb was actional or non-actional. We can make a number of conclusions from these results: Firstly they suggest that children have an adult-like syntactic representation for the passive before the age of five. Secondly, we can conclude that at this age, this representation is not restricted to item-based representations – priming occurred in the absence of repeated lexical items between prime and target suggesting that this representation is abstracted away from individual verb-based representations by three to four years of age. Thirdly, the fact that the priming effect was not influenced by the semantic class of the verbs used suggests that three and four year old English-speaking children's early representation of the passive is not limited to actional verbs only.

As such, the results of the experiment reported in this study contradict suggestions that the passive is late acquired (e.g. Borer & Wexler, 1987): 85% (17/20) of the three and four year old children tested produced at least one full passive description. These results therefore add to the literature showing that children younger than five years can produce the passive construction and support previous syntactic priming research that found structural priming of the passive at four years of age (e.g. Huttenlocher et al., 2004). Furthermore, this study extends both the priming literature and previous research on children's production of the passive since, unlike previous studies, it tested young children's production of the passive following both actional and non-actional primes. That there was no boost to the priming effect when the verbs in the prime and target were from the same semantic class (actional) nor drop in priming when they differed (non-actional prime to actional target) suggests that these children had a structural representation for the passive which was not constrained to actional verbs; as such these results also appear to contradict suggestions that the acquisition of the passive is semantically constrained (e.g. Maratsos et al. 1985).

However, the fact that these results showed no effect of Verb Type does leave open the question, why do children perform poorly on non-actional passives in comprehension tests? One potential explanation is methodological: Firstly, the non-actional verb events tested are particularly difficult to depict and so children may perform worse with these simply because the pictures, and not the language that is being tested, are difficult to reliably interpret. Secondly, their performance on these comprehension tests may be related to an underdeveloped ability to perform the required task rather than underdeveloped linguistic skills (Crain & Fodor, 1993). Indeed, it has previously been demonstrated that the task used may impact on the results of these tests: in comprehension tests of the same linguistic structures using different methods, Maratsos et al. (1985) found that performance was poorer when children were asked “who did it?” after hearing transitive sentences than when they were asked to identify the correct picture after hearing the same structures. Conversely, in the priming task used in this study, the participants had fewer non-linguistic tasks to perform and as such their language processing may have been less hindered hence they were able to comprehend the actional and non-actional passive primes and produce their own passive sentence descriptions. This would suggest that syntactic priming is an appropriate, additional method for testing early linguistic competence.

Another possible reason why the results reported here differ to previous findings may be related to the fact that, due to limitations in recruiting nursery-aged children, the age range of our group of children participants was rather large (3;1 – 4;11); it is possible that this group straddled a critical period of development with regards the questions asked in this study and so it may be prudent to test a separate group of children at each end of the range to see whether this would lead to more distinctive effects with regards the semantic class of the verbs tested.

A final possible answer to the question of why children perform poorly on non-actional passives in comprehension tests but responded to non-actional verb primes, is that the type of non-actional verb tested may be crucial to these results. The present study compared non-actional verbs that have a theme for the underlying subject and an experiencer for the underlying object (3a) whereas the verbs tested in comprehension tests that show poor comprehension of non-actional verb passives were verbs with an experiencer subject and theme object (3b).

- 3) a. The bear_[theme] is frightening the girl_[experiencer]
- b. The bear_[experiencer] is seeing the girl_[theme]

It may be that the acquisition of the passive is generalized early on to certain verbs, including actional verbs *and* object-experiencer, non-actional verbs but is not generalized to subject-experiencer non-actional verbs until a later age. Maratsos et al. (1985) make a similar suggestion supported by evidence that the input children receive tends to include passives with actional verbs and object-experiencer, rather than subject-experiencer, non-actional verbs. Ferreira (1994) also provides evidence that adults prefer to produce passives with object-experiencer non-actional verbs compared to subject-experiencer non-actional verbs and even actional verbs. If the input children receive is weighted towards object-experiencer and actional verb passives this may explain both their poor performance in comprehension tests of subject-experiencer non-actional verb passives and also our priming results showing no difference between actional and object-experiencer non-actional verb primes. Clearly, further testing is required to compare subject-experiencer non-actional verb primes with the present study's results. If the passive is generalized to subject-experiencer non-actional verbs later than actional and object-experiencer non-actional verbs then we would expect these primes to elicit fewer passives.

5 Conclusion

In this syntactic priming study we found that both children and adults were more likely to produce passive targets following passive primes than active primes, irrespective of whether the prime contained an actional or non-actional verb. We conclude that children do acquire an abstract syntactic representation for the passive early on that is generalized to actional and object-experiencer non-actional verbs.

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